

# Eco514—Game Theory

## Problem Set 3: Due Thursday, October 28

### 1. Asymmetric Auctions

Consider an interdependent-values auction with two bidders, each of whom observes an i.i.d. uniform signal  $s_i \in [0, 1]$ . Bidder  $i$ 's valuation for the object is equal to  $v_i(s_i, s_{-i}) = \lambda_i s_i + s_{-i}$ , where  $\lambda_i > 1$  but in general  $\lambda_1 \neq \lambda_2$ .

(a) Construct a Bayesian Nash equilibrium of the second-price auction in this environment. Is the outcome efficient?

(b) Now construct a Bayesian Nash equilibrium of the first-price auction in this environment. Is the outcome efficient? Does revenue equivalence hold?

### 2. Auctions with a reserve price

In the setting of the previous exercise, suppose that the seller decides to set a positive reserve price  $r > 0$ : that is, all bids below the reserve price are discarded (so, in particular, it may be the case that both bids are discarded). Assume that the value of  $r$  is publicly announced before the auction begins, so it is commonly known.

Construct an equilibrium of the second-price auction in this environment, and express the expected revenues to the seller as a function of  $r$ . Does setting  $r = 0$  maximize the seller's expected revenues?

### 3. From OR: 99.1, 101.3, 108.1

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